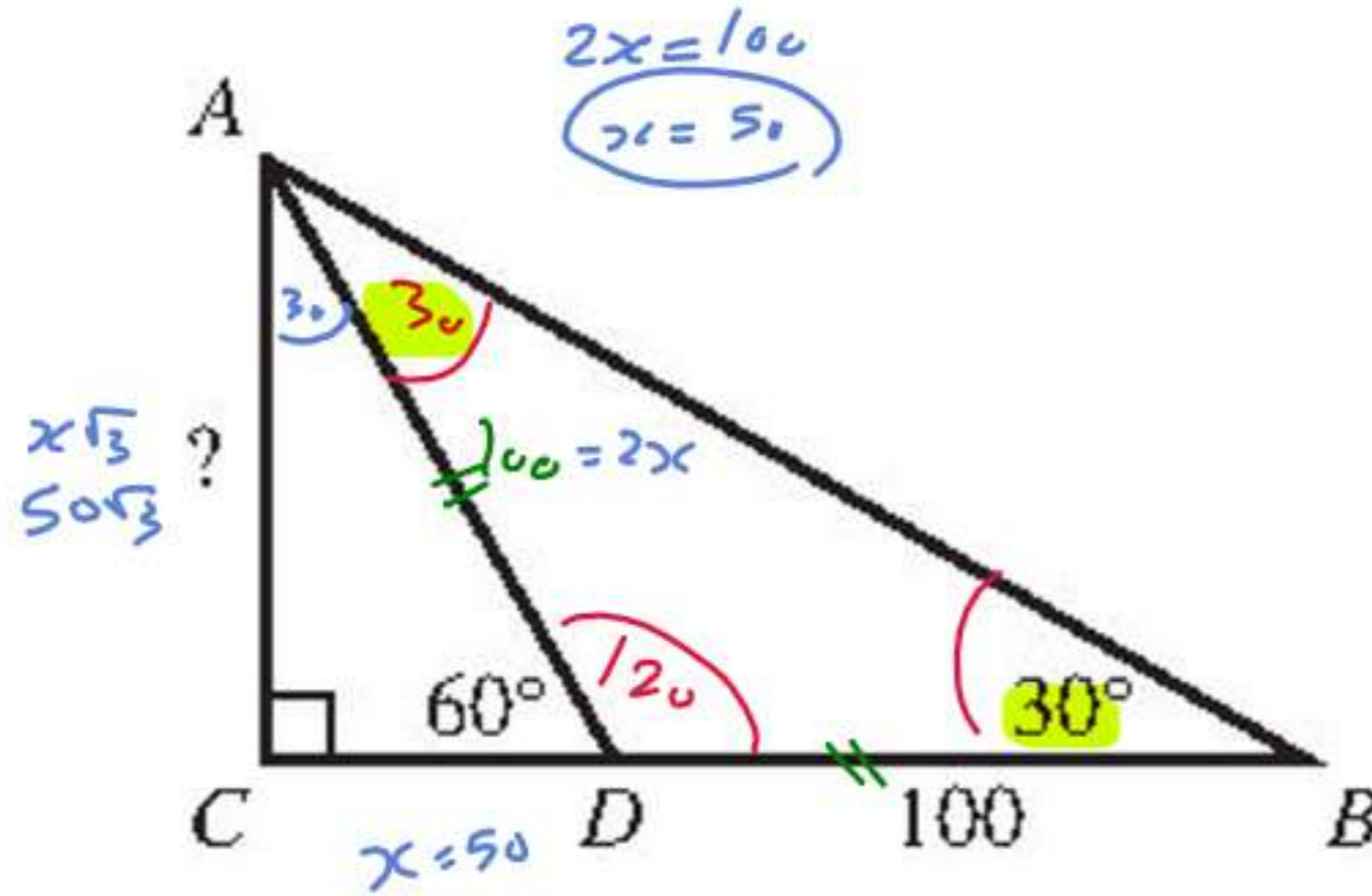
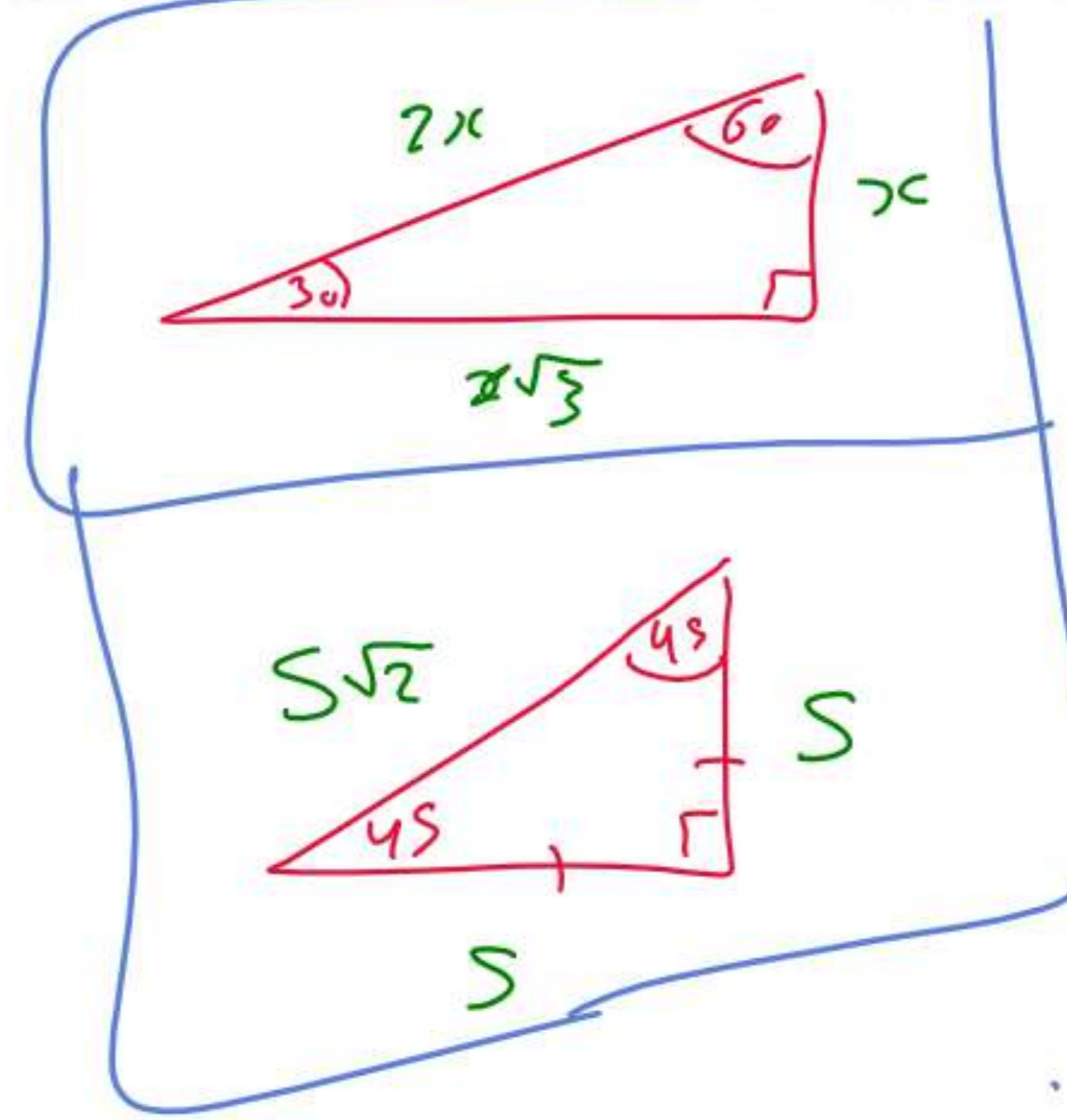


43. In the figure shown below, $\triangle ACB$ is a right triangle with a right angle at C . Point D is on \overline{BC} , $m\angle ADC = 60^\circ$, $m\angle ABC = 30^\circ$, and $BD = 100$ feet. What is the length, in feet, of \overline{AC} ?

- A. 50
- B. $\frac{100}{3}$
- C. $\frac{200}{3}$
- D. $50\sqrt{3}$**
- E. $200\sqrt{3}$



DO YOUR FIGURING HERE.



44. A relation pairs elements in the domain with elements in the range. The table below defines a relation where the domain is represented by the x -values and the range is represented by the y -values.

Son x	Father y
3	6
7	9
1	5
3	4
4	5
2	8

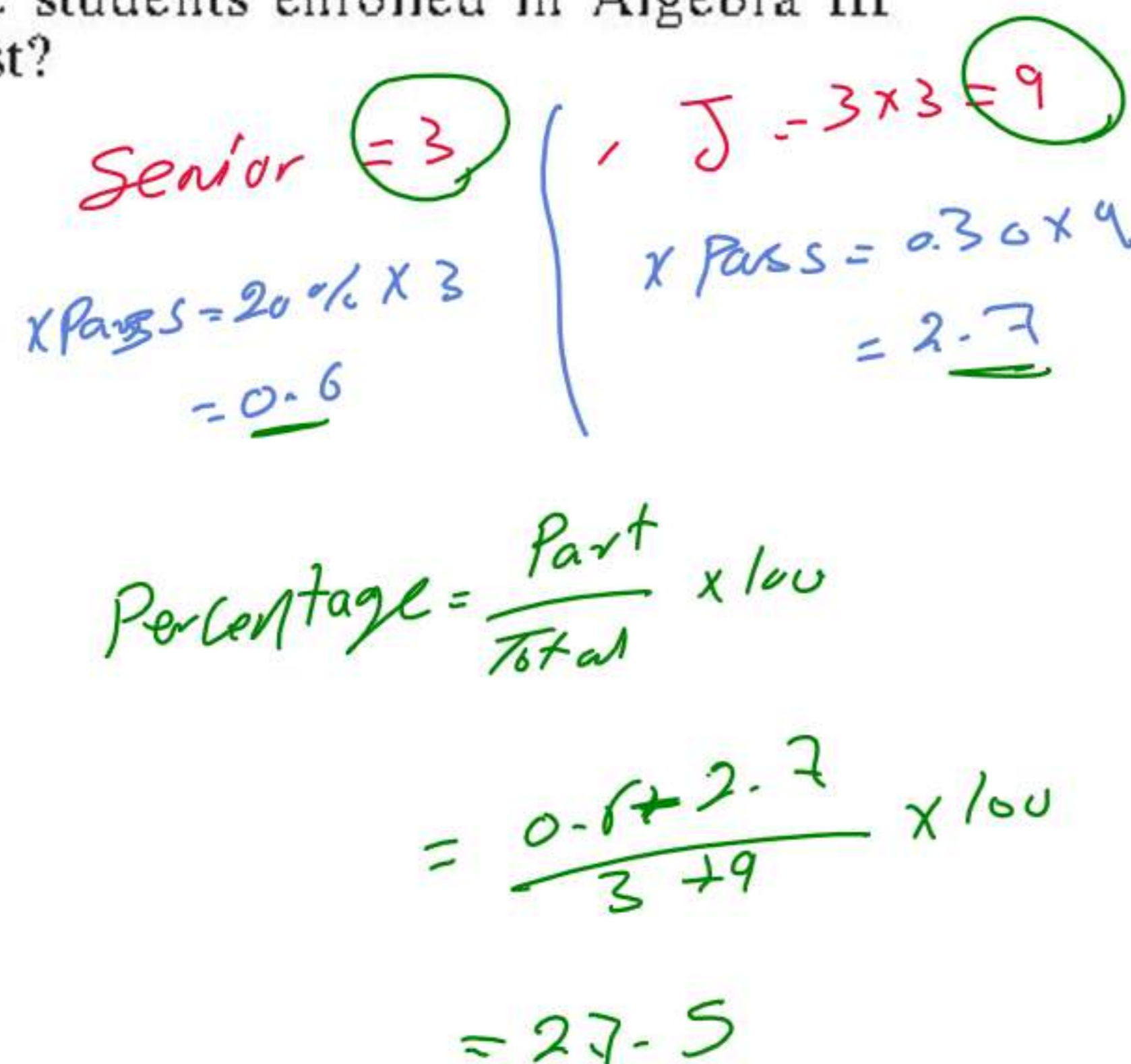
not function

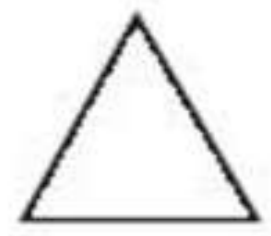
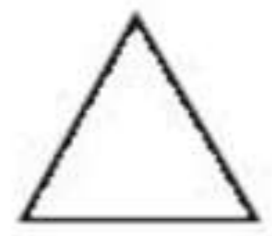
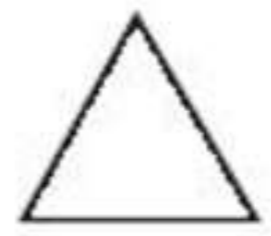
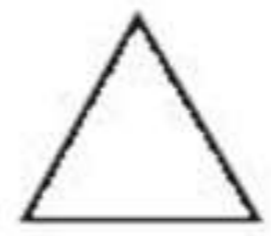
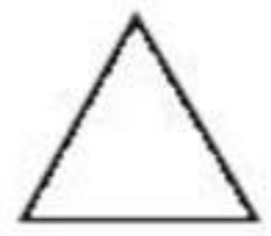
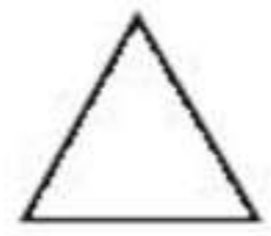
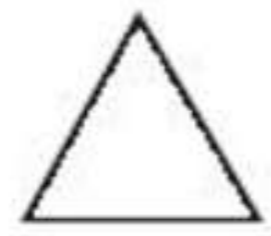
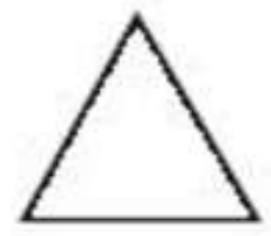
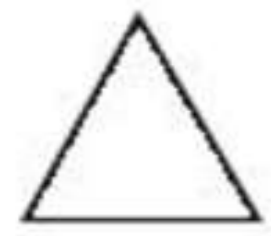
Which of the following statements indicates whether this relation is a function of x and provides a valid reason?

- ~~I.~~ It is, because the y -value is always greater than the x -value.
- ~~J.~~ It is, because there are 5 distinct values in both the domain and the range.
- H.** It is not, because there are 2 different y -values paired with the x -value 3.
- J. It is not, because there are 2 different x -values paired with the y -value 5.
- K. It is not, because no equation can be written to model the relationship between x and y .

45. Only juniors and seniors are enrolled in Algebra III. There are 3 juniors for each senior. On an Algebra III test, 80% of the juniors and 70% of the seniors passed. What percent of the students enrolled in Algebra III did NOT pass the test?

- A. $22\frac{1}{2}\%$
- B. $24\frac{1}{6}\%$
- C. 25%
- D. $27\frac{1}{2}\%$**
- E. 50%





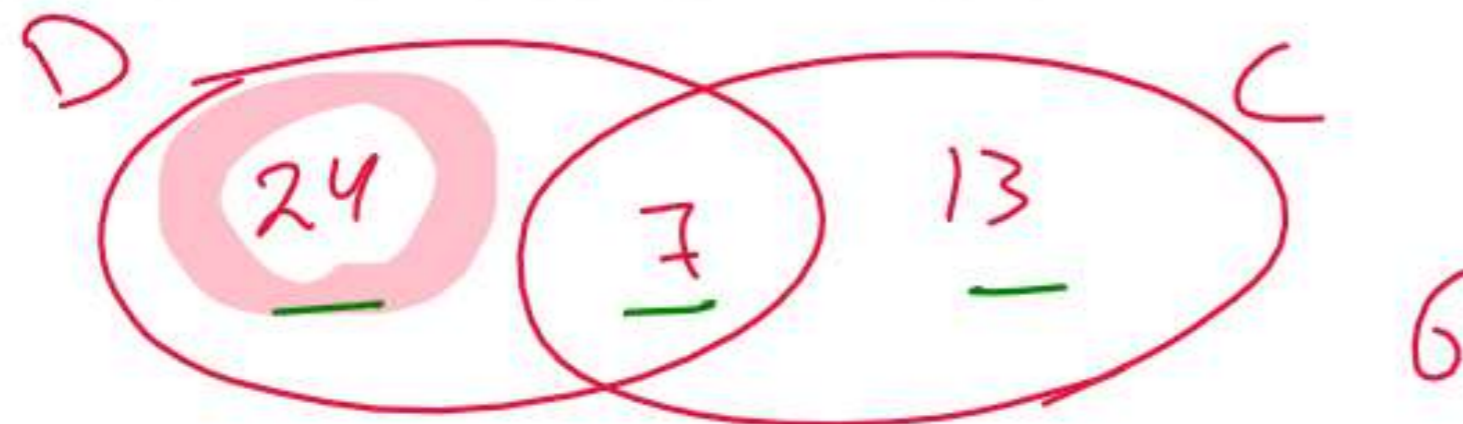
Use the following information to answer questions 46–48.

DO YOUR FIGURING HERE.

At a local pet store, 50 shoppers were polled to see if they owned cats or dogs. Among the polled shoppers, 31 owned at least 1 dog, 20 owned at least 1 cat, 7 owned at least 1 dog and at least 1 cat, and 6 owned neither a dog nor a cat.

46. How many of the 50 polled shoppers owned at least 1 dog but did NOT own at least 1 cat?

- E. 11
- G. 13
- H. 23
- J. 24
- K. 25



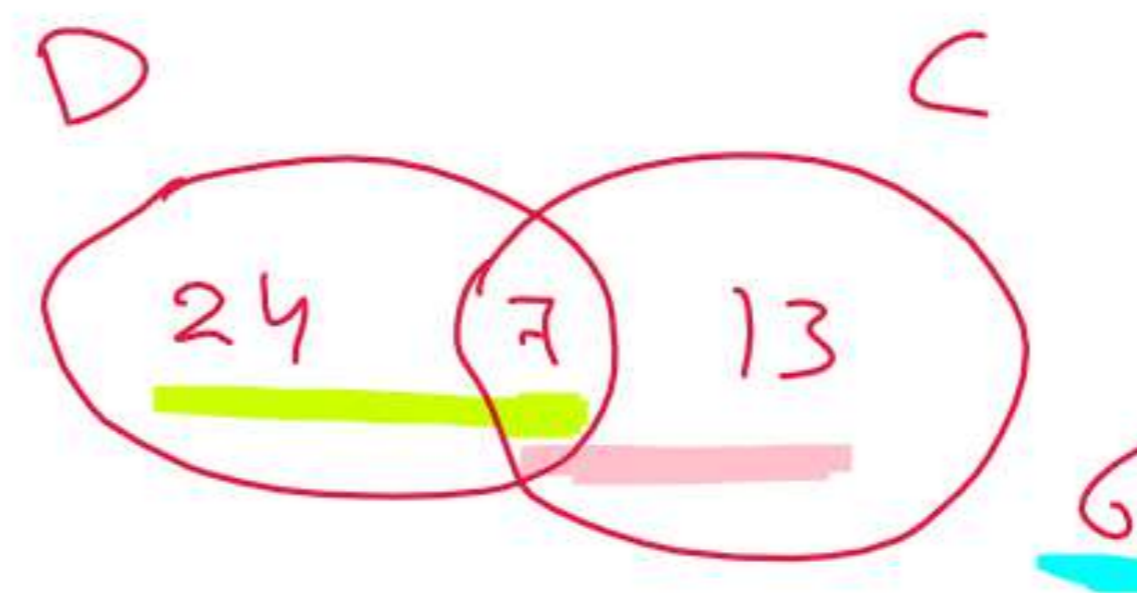
47. One of the 50 polled shoppers will be selected at random. What is the probability that the selected shopper owned at least 1 dog or cat?

- A. $\frac{7}{50}$
- B. $\frac{13}{25}$
- C. $\frac{27}{50}$
- D. $\frac{19}{25}$
- E. $\frac{22}{25}$

Prob. = $\frac{\text{Part}}{\text{Total}} = \frac{24+7+13}{50}$

48. Every polled shopper was given at least 1 gift for taking part in the survey. Those who owned at least 1 dog were given 1 dog toy valued at \$4, those who owned at least 1 cat were given 1 cat toy valued at \$3, and those who owned neither were given a gift card with a dollar value of g . A total dollar value of t was given to the shoppers. Which of the following expressions gives the value of g in terms of t ?

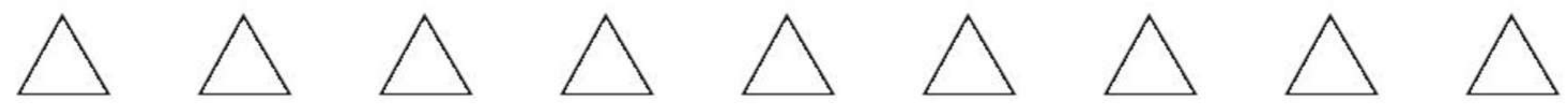
- E. $\frac{t}{6} - 177$
- G. $\frac{t}{6} - 184$
- H. $\frac{t-135}{6}$
- J. $\frac{t-177}{6}$
- K. $\frac{t-184}{6}$



$31 \times 4 + 20 \times 3 + 6g = t$

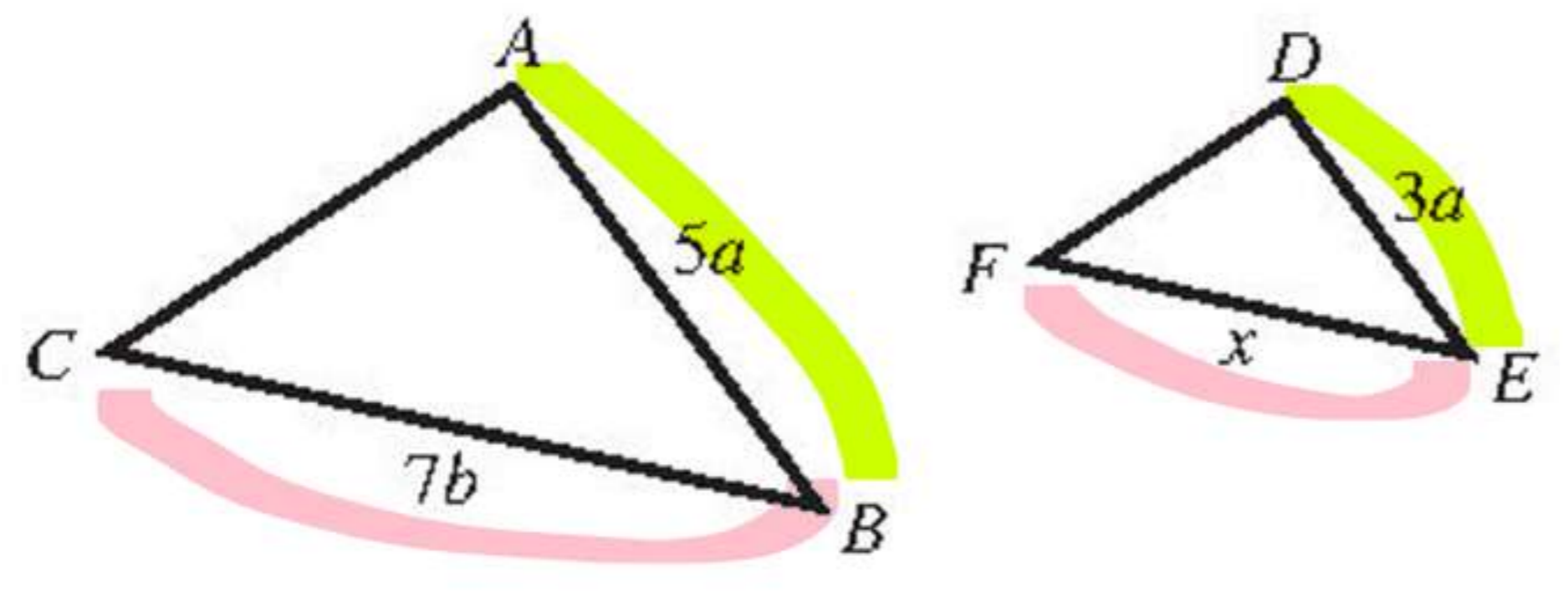
$184 + 6g = t$

$6g = \frac{t-184}{6}$



49. In the figure shown below, $\triangle ABC \sim \triangle DEF$, and the given lengths are in inches. Which of the following expressions gives the value of x in terms of b ?

DO YOUR FIGURING HERE.



- A. b
- B. $\frac{21}{5}b$
- C. $5b$
- D. $9b$
- E. $\frac{35}{3}b$

Handwritten work for question 49:

$$\frac{5a}{3a} = \frac{7b}{x}$$

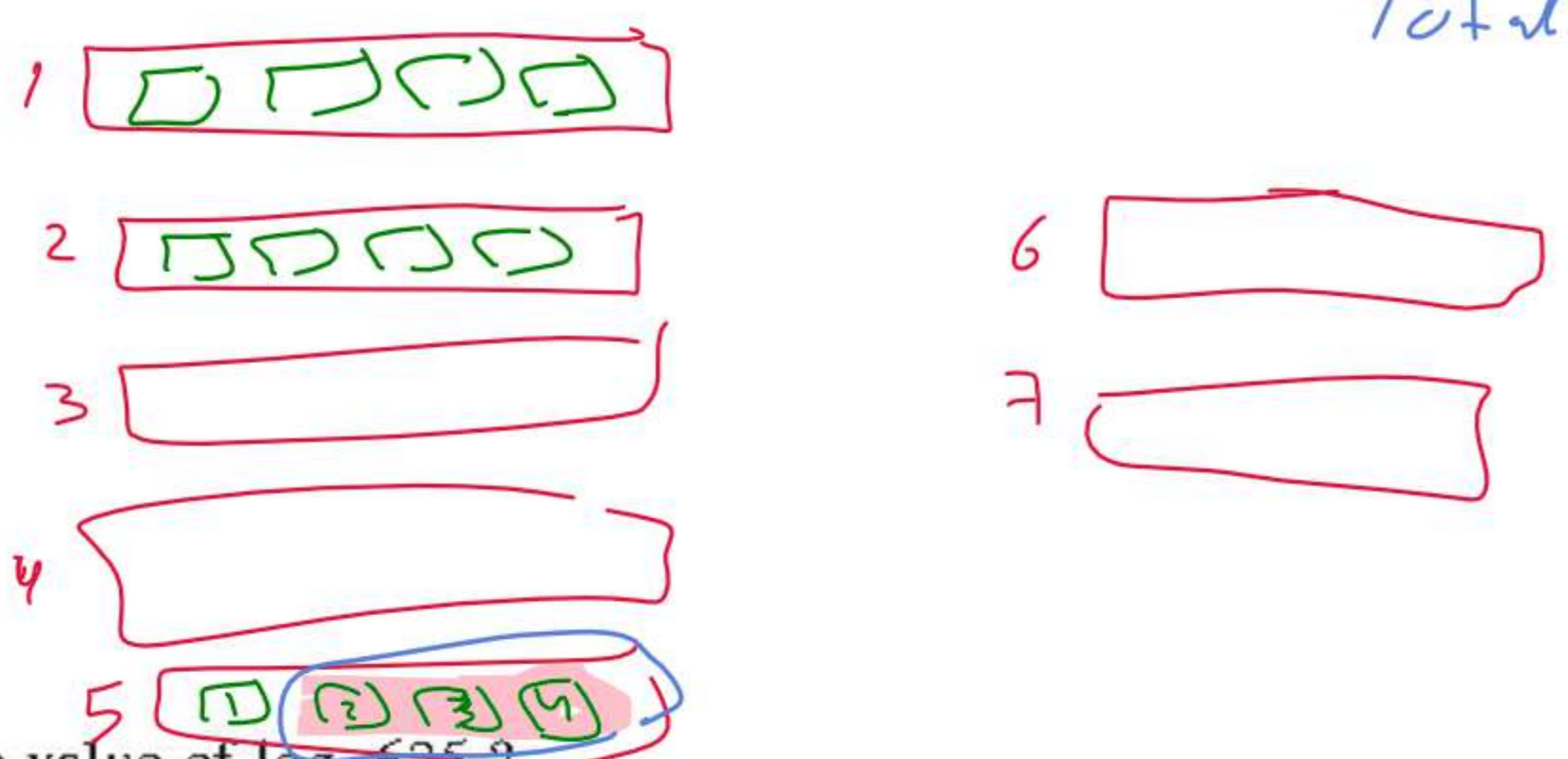
$$x = \frac{3 \times 7b}{5} = \frac{21}{5}b$$

50. Each student in Mrs. O'Malley's first-period Civics class draws 1 tag at random from each of 2 bowls to determine seating location in the class. The tag drawn from the first bowl is the row number of a student's seat; the 28 tags in the first bowl have an equal distribution of the numbers 1, 2, 3, 4, 5, 6, and 7. The tag drawn from the second bowl is the seat number within the row determined by the first tag; the 28 tags in the second bowl have an equal distribution of the numbers 1, 2, 3, and 4. What is the probability that the first student who draws will have a seating location that is in Row 5, but NOT in Seat 1?

Handwritten formula for probability:

$$\text{Prob.} = \frac{\text{Part}}{\text{Total}} = \frac{3}{28}$$

- F. $\frac{1}{28}$
- G. $\frac{3}{28}$
- H. $\frac{6}{28}$
- J. $\frac{9}{28}$
- K. $\frac{18}{28}$



51. What is the value of $\log_5 625$?

- A. 3
- B. 4
- C. 6
- D. 125
- E. 436

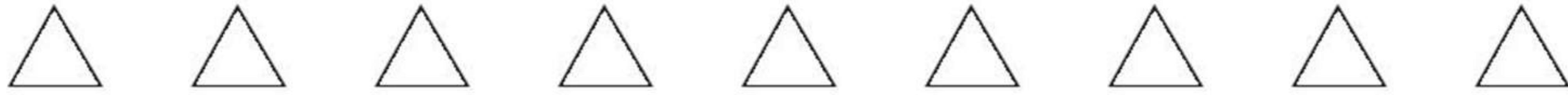
52. The inequality $7x^2y < 0$ is true for 2 fixed real numbers x and y . Which of the following inequalities *must* be true?

- F. $x > 0$
- G. $y > 0$
- H. $x < 0$
- J. $y < 0$
- K. $xy < 0$

Handwritten work for question 52:

$$7x^2y < 0$$

Since $7x^2$ is always positive, $y < 0$ must be true.



53. Given that $c \neq d$, what are all the real values of b that make the inequality $\frac{bc - bd}{6c - 6d} < 0$ true?

DO YOUR FIGURING HERE.

- A. 6 only
- B. $\frac{1}{6}$ only
- C. $-\frac{1}{6}$ only
- D. All positive real numbers
- E. All negative real numbers

$$\frac{b(c-d)}{6(c-d)} < 0$$

$$\frac{b}{6} < 0$$

$$b < 0 \times 6$$

$$b < 0$$

54. For all negative values of k , what is the range of values of 2^k ?

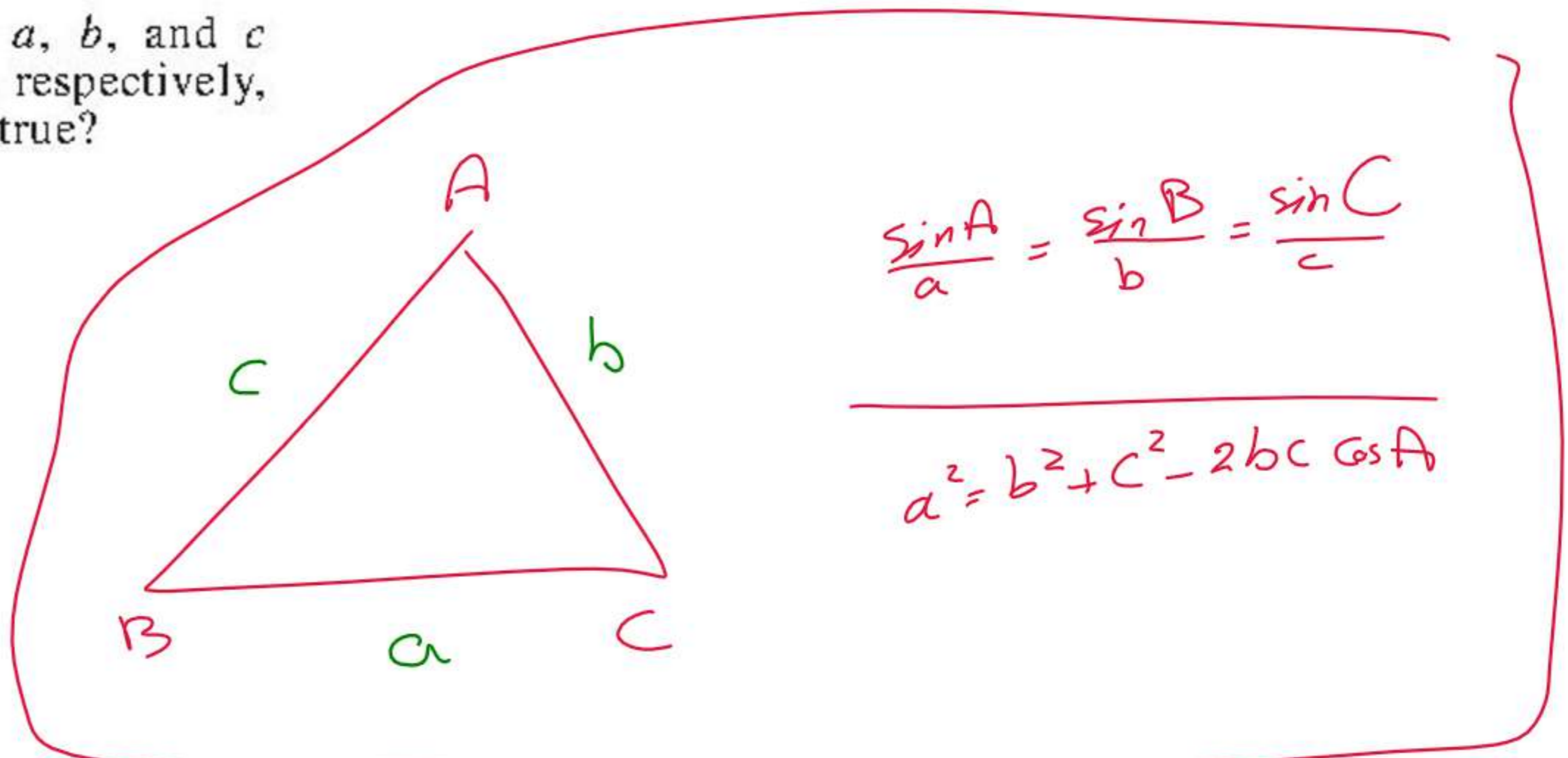
- F. All negative numbers
- G. All numbers less than 1
- H. All rational numbers less than 1
- J. All positive numbers less than 1
- K. All positive numbers less than 2

$$k = -7 \quad | \quad k = -2$$

$$2^{-7} = 0.00078125 \quad | \quad 0.25$$

55. For all triangles with sides of length a , b , and c opposite angles of measure A , B , and C , respectively, which of the following equations *must* be true?

- A. $\frac{a}{A} = \frac{b}{B}$
- B. $\frac{\sin a}{A} = \frac{\sin b}{B}$
- C. $\frac{a}{\cos A} = \frac{b}{\cos B}$
- D. $b^2 = a^2 + c^2 - 2ab(\sin B)$
- E. $c^2 = a^2 + b^2 - 2ab(\cos C)$



56. Event A consists of 6 simple events. Event B consists of 3 simple events, none of which are in Event A. Event C is the union of A and B, and Event D is the intersection of A and B. Which of the following statements is true?

(Note: Given that Event X consists of n simple events, $|X| = n$.)

- E. $|B| < |A| < |C| < |D|$
- G. $|B| < |A| < |D| < |C|$
- H. $|C| < |B| < |A| < |D|$
- J. $|D| < |B| < |A| < |C|$
- K. $|D| < |C| < |B| < |A|$

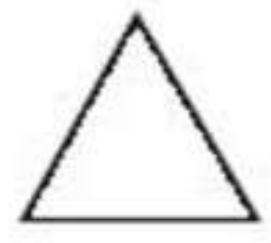
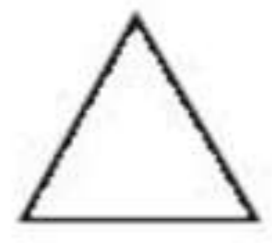
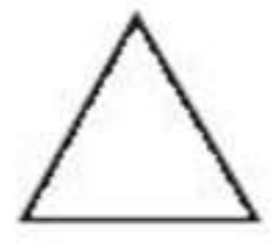
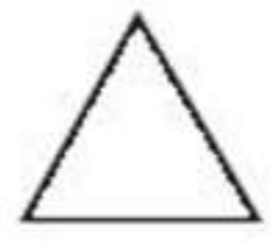
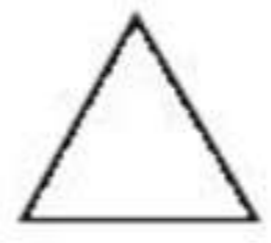
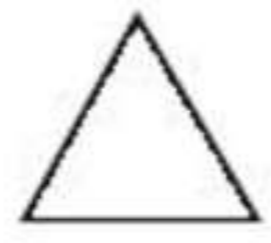
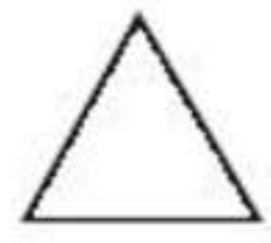
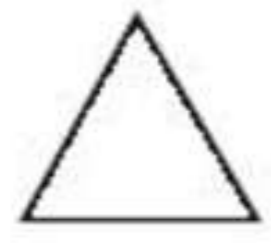
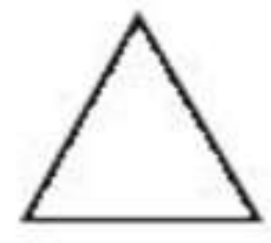
$$A = 6$$

$$B = 3$$

$$C = 9$$

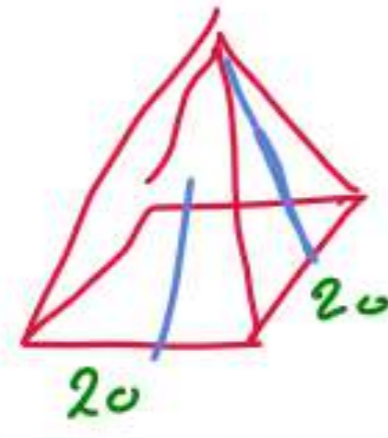
$$D = 0$$

D B A C



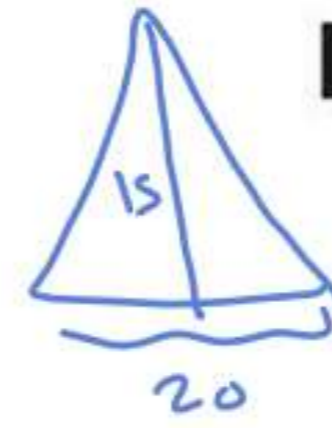
57. The base of a right square pyramid has a side length of 20 ft. The pyramid's slant height is 15 ft. What is the total surface area, in square feet, of the pyramid?

- A. 550
- B. 600
- C. 1,000**
- D. 1,600
- E. 2,000



5×5
 20×20
 400

$+ 4 \cdot \Delta$
 $+ 4 \left(\frac{1}{2} b \cdot h \right)$
 $+ 4 \left(\frac{1}{2} \times 20 \times 15 \right) = 1000$



DO YOUR FIGURING HERE.

58. For how many integers x is the value of the expression $(x-1)(x-4)$ a positive prime number?

- E. 0**
 - G. 1
 - H. 2
 - J. 3
 - K. 4
- $x-1=1 \Rightarrow x=2$
 $x-4=1 \Rightarrow x=5$
 $(2-1)(2-4) = -2$
 $(5-1)(5-4) = 4$

$5 = 1 \times 5$
 $2 = 1 \times 2$
 $7 = 1 \times 7$

59. Which of the following degree values of x is **NOT** in the domain of the function below?

$f(x) = \frac{1}{1 + \sec x}$

- A. 0°
- B. 45°
- C. 60°
- D. 150°
- E. 180°**

$\frac{1}{1 + \frac{1}{\cos x}} = \frac{1}{1 + \frac{1}{\cos 180}} = \text{error}$

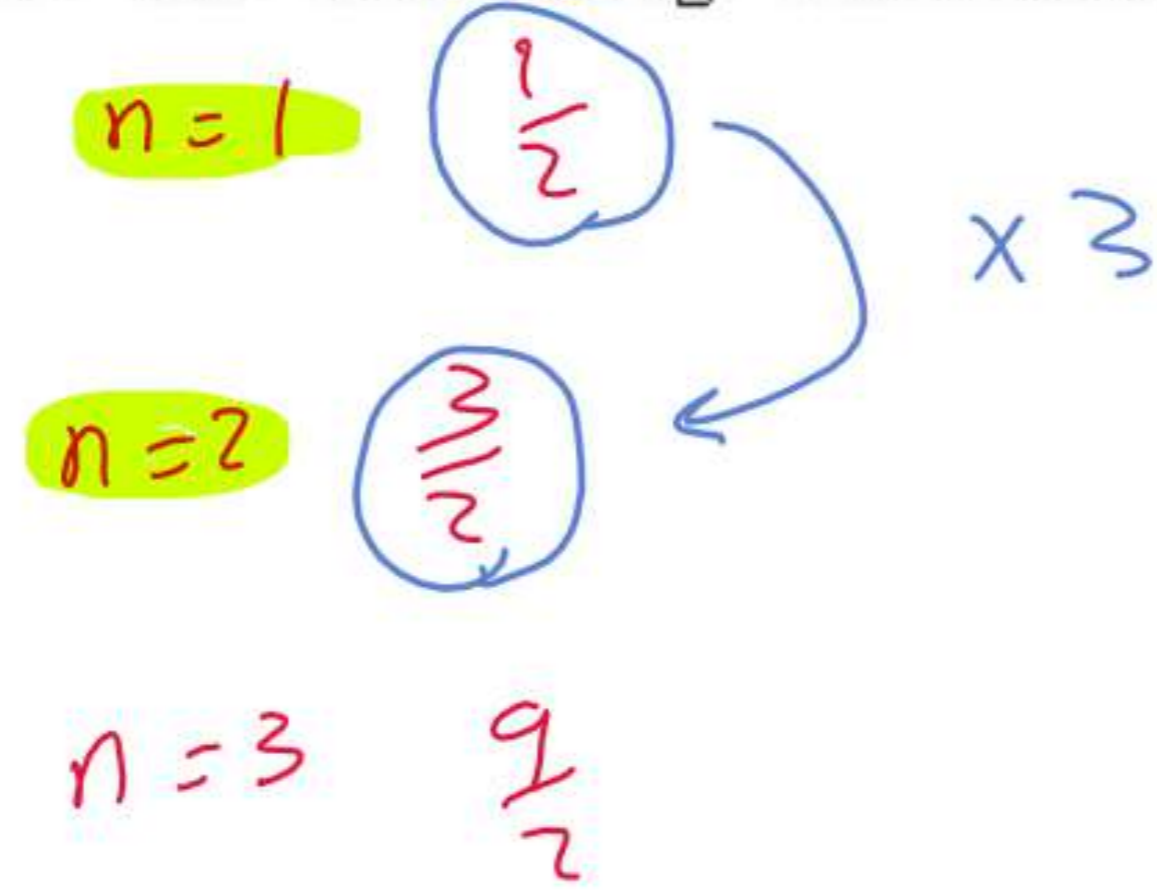
$\sec x = \frac{1}{\cos x}$
 $\csc x = \frac{1}{\sin x}$
 $\cot x = \frac{1}{\tan x}$

60. The function below is defined for constants a and b and for all positive integers n .

$r(n) = ab^n$

It is known that $r(1) = \frac{1}{2}$, $r(2) = \frac{3}{2}$, $r(3) = \frac{9}{2}$, and $r(4) = \frac{27}{2}$. Which of the following functions is equivalent to $r(n)$?

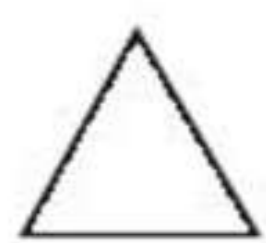
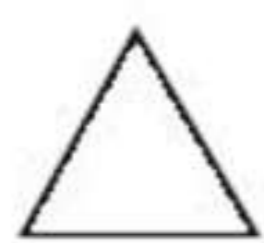
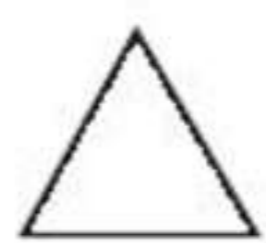
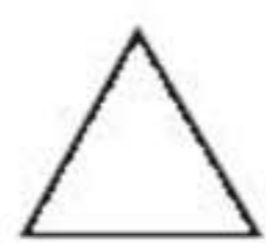
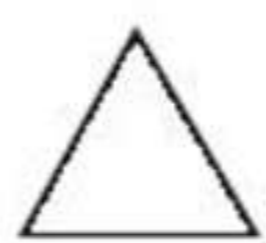
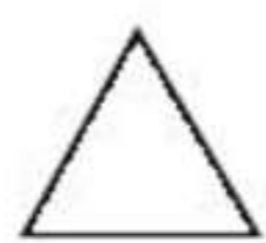
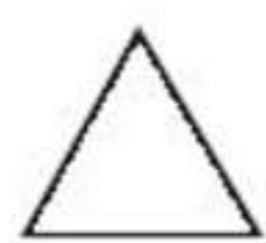
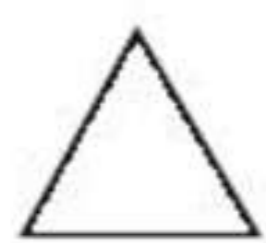
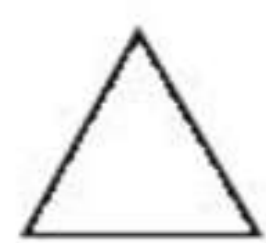
- F. $f(n) = 3\left(\frac{1}{2}\right)^{n-1}$
- G. $g(n) = 3\left(\frac{1}{2}\right)^n$
- H. $h(n) = \frac{1}{2}\left(\frac{3}{2}\right)^{n-1}$
- J. $j(n) = \frac{1}{2}(3)^{n-1}$**
- K. $k(n) = \frac{1}{2}(3)^n$



END OF TEST 2

STOP! DO NOT TURN THE PAGE UNTIL TOLD TO DO SO.

DO NOT RETURN TO THE PREVIOUS TEST.



MATHEMATICS TEST

60 Minutes—60 Questions

DIRECTIONS: Solve each problem, choose the correct answer, and then fill in the corresponding oval on your answer document.

Do not linger over problems that take too much time. Solve as many as you can; then return to the others in the time you have left for this test.

You are permitted to use a calculator on this test. You may use your calculator for any problems you choose,

but some of the problems may best be done without using a calculator.

Note: Unless otherwise stated, all of the following should be assumed.

1. Illustrative figures are NOT necessarily drawn to scale.
2. Geometric figures lie in a plane.
3. The word *line* indicates a straight line.
4. The word *average* indicates arithmetic mean.

1. Given $4x - 9 = 6x - 15$ is true, $x = ?$

A. -12

B. -3

C. $-\frac{12}{5}$

D. $\frac{12}{5}$

E. 3

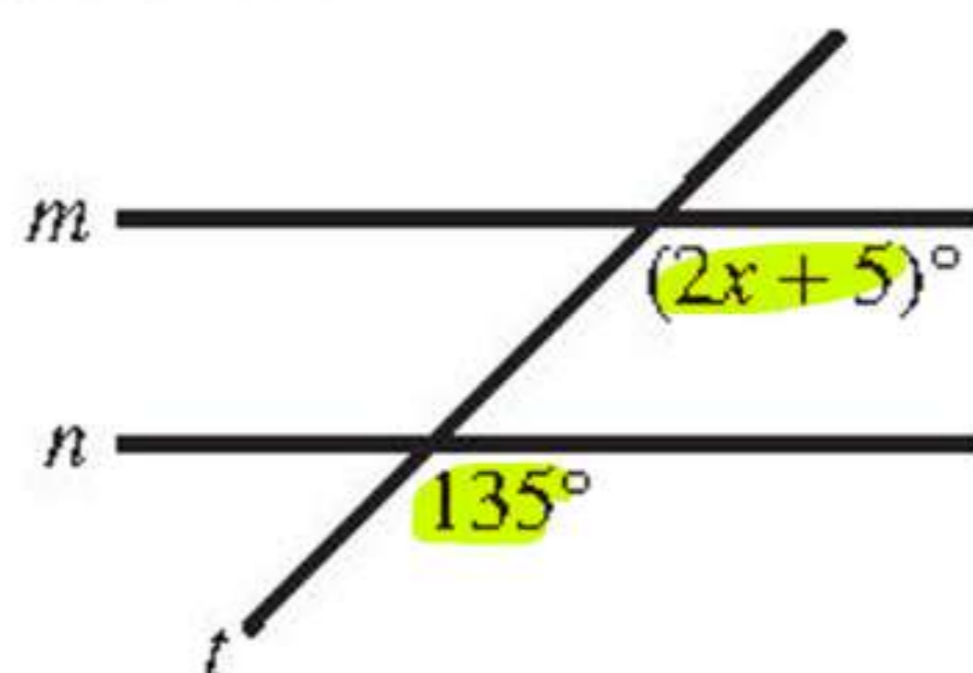
$$-9 + 15 = 6x - 4x$$

$$6 = 2x$$

$$3 = x$$

DO YOUR FIGURING HERE.

2. In the figure below, parallel lines m and n are cut by transversal line t , and 2 angle measures are given. What is the value of x ?



F. 20

G. 25

H. 30

J. 65

K. 70

$$2x + 5 = 135$$

$$65$$

3. The 1st term in the geometric sequence below is -9 . If it can be determined, what is the 6th term?

$-9, 18, -36, 72, -144, \dots$

A. -288

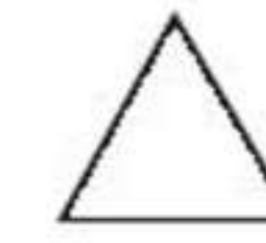
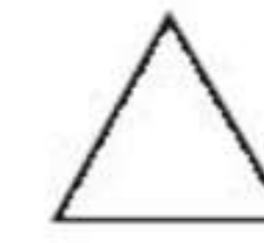
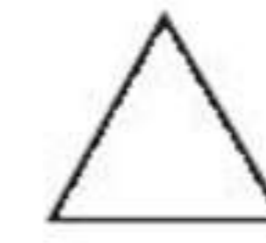
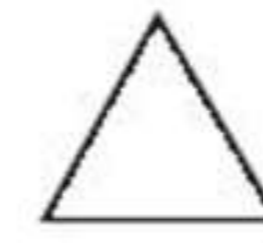
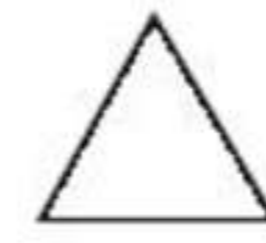
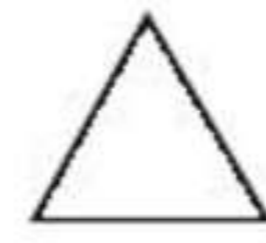
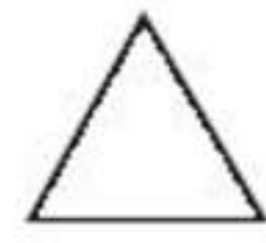
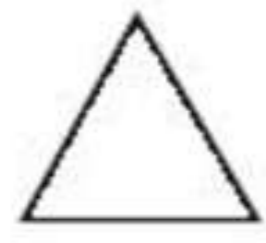
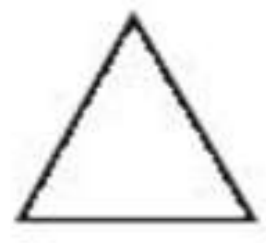
B. -216

C. 216

D. 288

E. Cannot be determined from the given information

$$18 \div -9 = -2$$



DO YOUR FIGURING HERE.

4. A yogurt shop has 6 flavors of yogurt and 5 toppings. Each sundae consists of 1 yogurt flavor and 1 topping. Jaylen decided to surprise Takoda with a sundae, but he did not know her preferences. Given that Takoda has a preference of 1 flavor of yogurt and 1 topping from those available in the shop, what is the probability that Jaylen will choose the topping and yogurt that Takoda prefers?

- F. $\frac{1}{30}$
 G. $\frac{1}{11}$
 H. $\frac{1}{6}$
 J. $\frac{1}{5}$
 K. $\frac{1}{4}$

$$\frac{1}{6 \times 5} \quad \frac{1}{30}$$

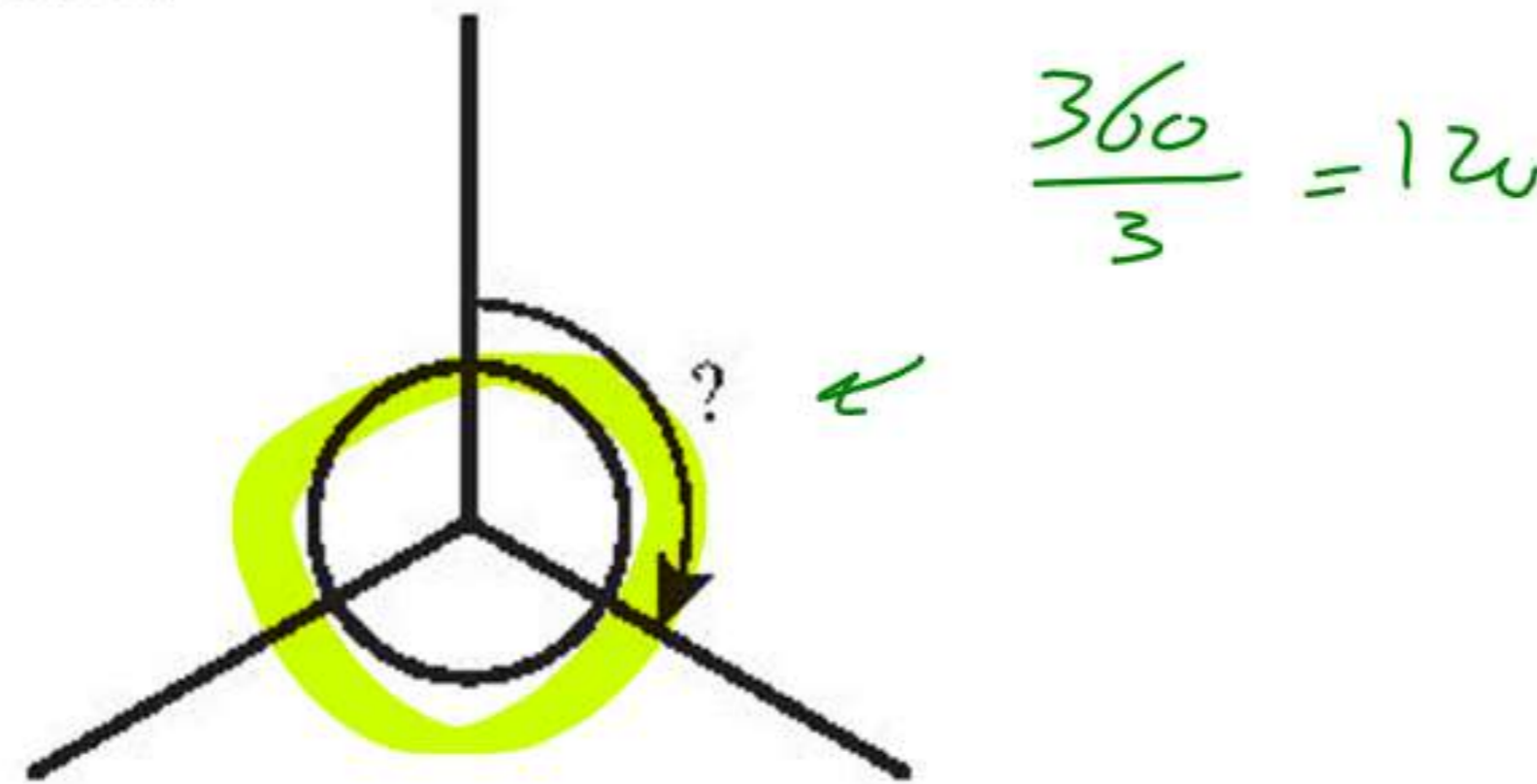
5. How many minutes would it take a ship to travel 100 miles at a constant speed of 40 miles per hour?

- A. 24
 B. 40
 C. 60
 D. 150
 E. 250

$$\begin{array}{l} \text{mils} \\ 40 \\ 100 \end{array} \times \begin{array}{l} \text{h} \\ 60 \\ 24 \end{array} \quad \frac{60 \times 100}{40} = 150$$

6. A fan has 3 evenly spaced blades of negligible thickness, as shown below. What is the measure of an angle between 2 blades?

- F. 30°
 G. 60°
 H. 90°
 J. 100°
 K. 120°



7. $|6 - 5| - |3 - 7| = ?$

- A. -5
 B. -3
 C. 3
 D. 5
 E. 21

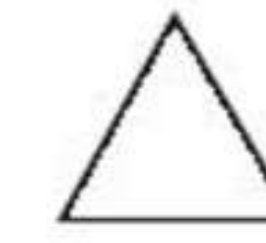
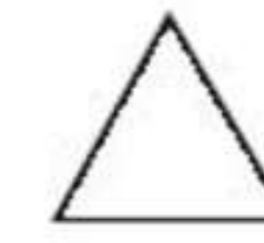
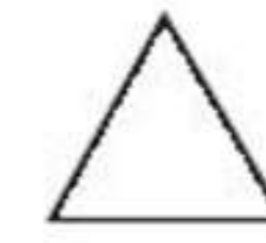
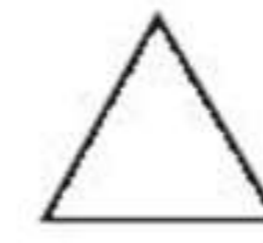
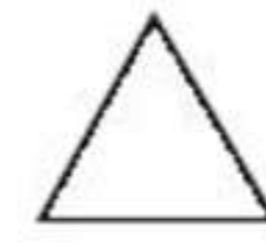
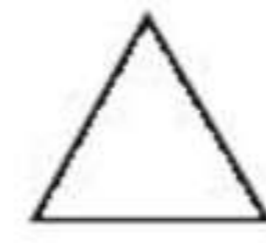
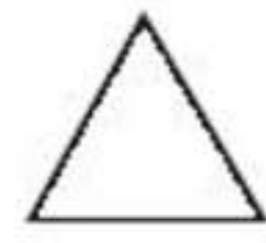
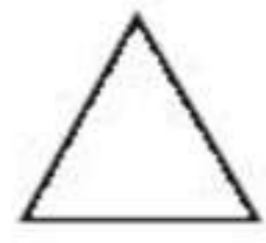
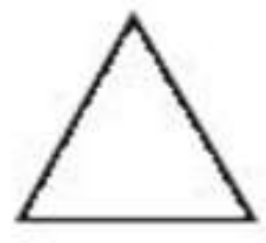
$$\text{shift hop}$$

8. Which of the following values is the solution to the equation below?

- F. 12
 G. $12\frac{3}{8}$
 H. $12\frac{3}{4}$
 J. 36
 K. 51

$$\frac{2}{3}x + \frac{1}{4} = 8\frac{1}{4}$$

shift
 $\frac{D}{E}$
 shift same



9. What is the volume, in cubic inches, of a sphere with a diameter of 10 inches?

$$r = 5$$

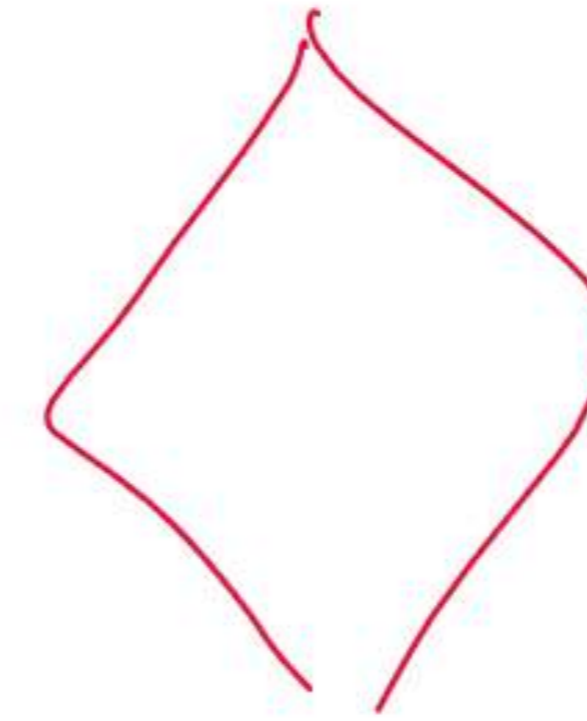
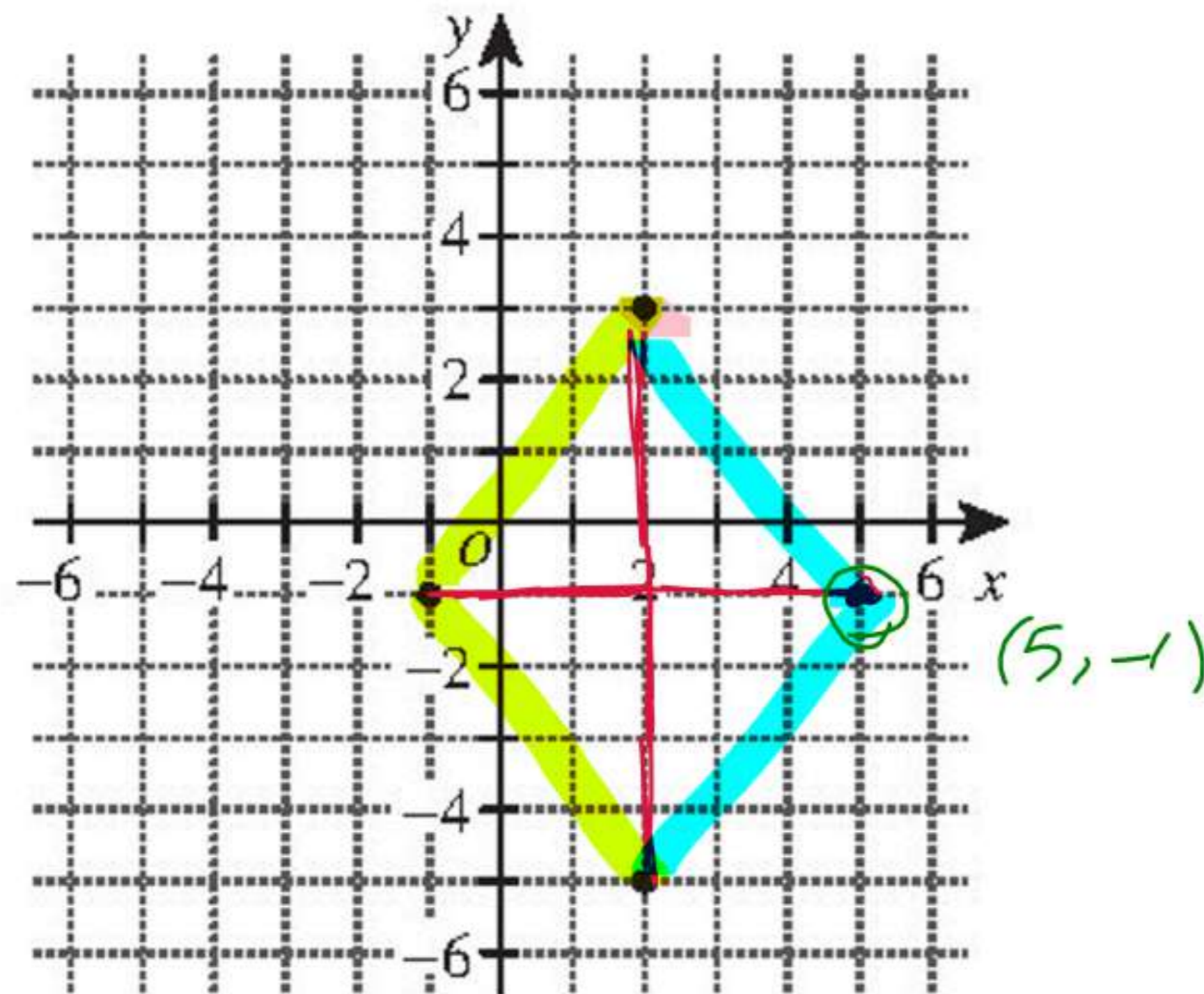
(Note: The volume of a sphere, V , with radius r is given by the formula $V = \frac{4}{3}\pi r^3$.)

- A. $\frac{60\pi}{3}$
 B. $\frac{100\pi}{3}$
 C. $\frac{400\pi}{3}$
 D. $\frac{500\pi}{3}$
 E. $\frac{4,000\pi}{3}$

$$\frac{4}{3}\pi(5)^3 = \frac{500\pi}{3}$$

DO YOUR FIGURING HERE.

10. A rhombus is a quadrilateral with all 4 sides of equal length. Three vertices of a rhombus are graphed in the standard (x,y) coordinate plane below.



One of the following points is the location of the 4th vertex of this rhombus. Which one?

- F. $(4, -1)$
 G. $(5, -4)$
 H. $(5, -1)$
 J. $(6, -2)$
 K. $(6, 0)$
11. For an architecture class project, Lizette is making a scale drawing of Mr. Patel's classroom, which is rectangular with a width of 25 feet and a length of 30 feet. Lizette draws a 3-inch line segment to represent the width of the rectangle. How long a line segment, in inches, should Lizette draw to represent the length of the rectangle?

A. $2\frac{1}{2}$

B. 3

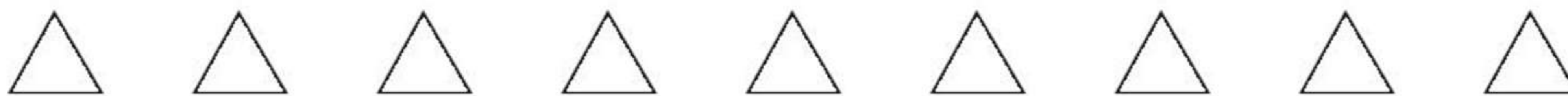
C. $3\frac{3}{5}$

D. $4\frac{7}{12}$

E. 5

$$\begin{array}{r} w \quad l \\ 25 \quad 30 \\ 3 \quad x \end{array}$$

$$\frac{3 \times 30}{25} = 3.6 = 3\frac{3}{5}$$



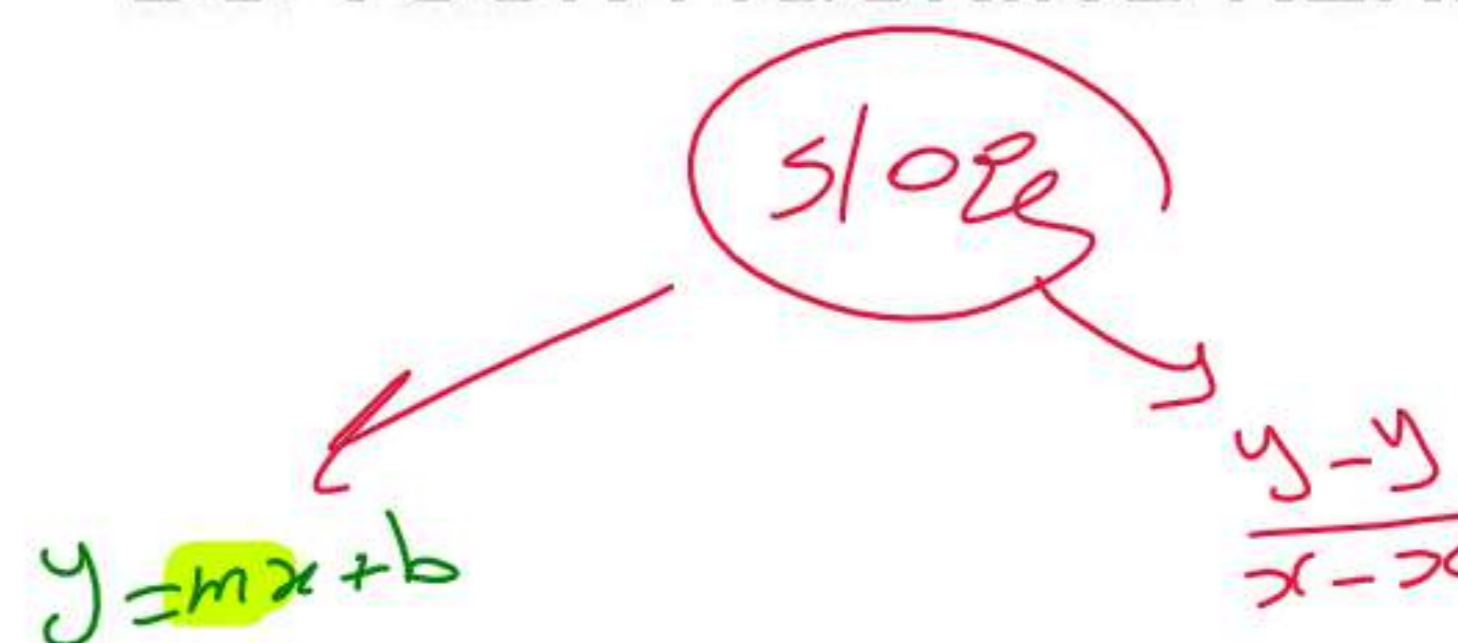
12. In the standard (x,y) coordinate plane, a line intersects the y-axis at (0,3) and contains the point (9,4). What is the slope of the line?

DO YOUR FIGURING HERE.

- E. $\frac{1}{9}$
- G. $\frac{3}{5}$
- H. $\frac{2}{3}$
- J. $\frac{3}{2}$
- K. 9

$$\frac{y-y_1}{x-x_1} = \frac{4-3}{9-0}$$

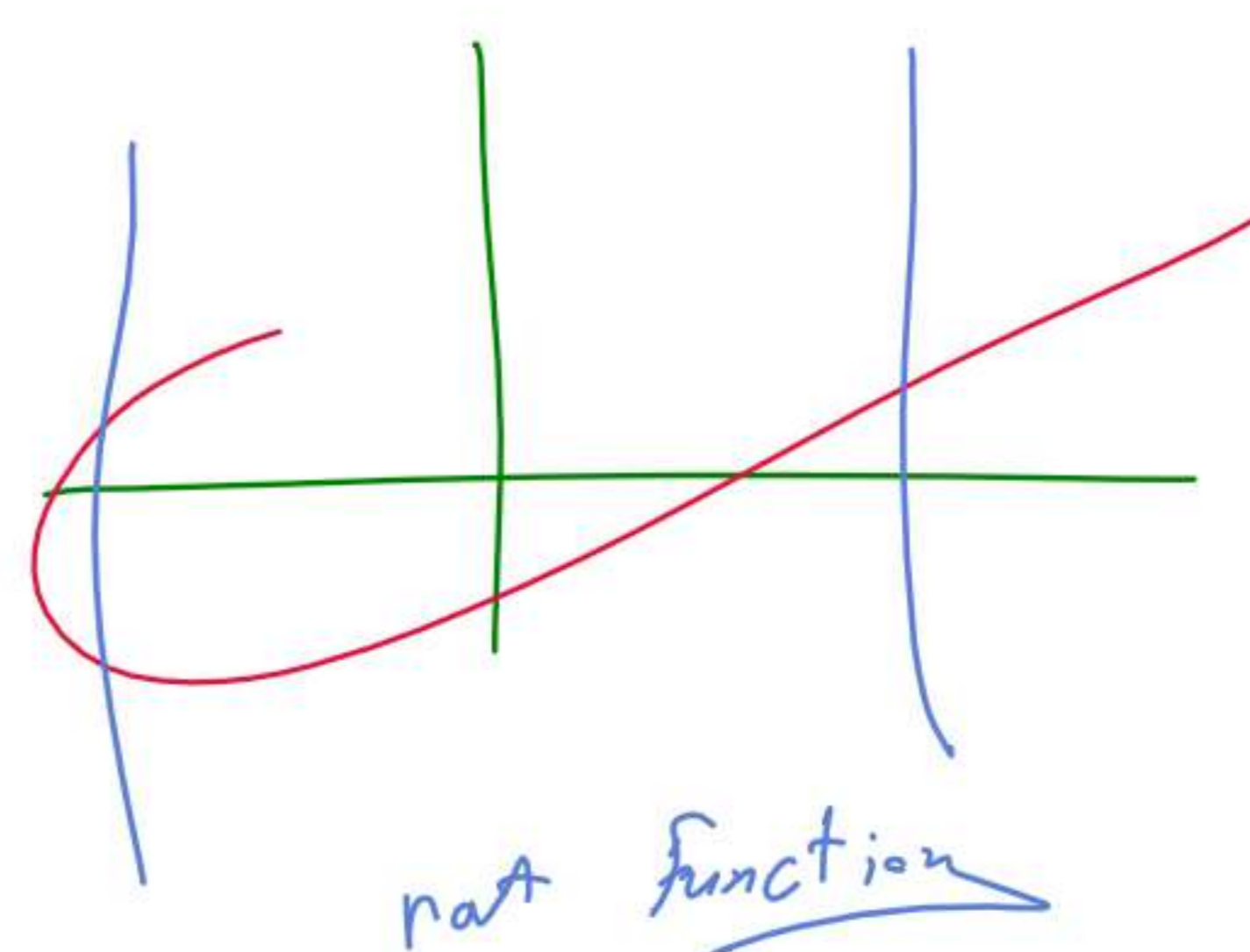
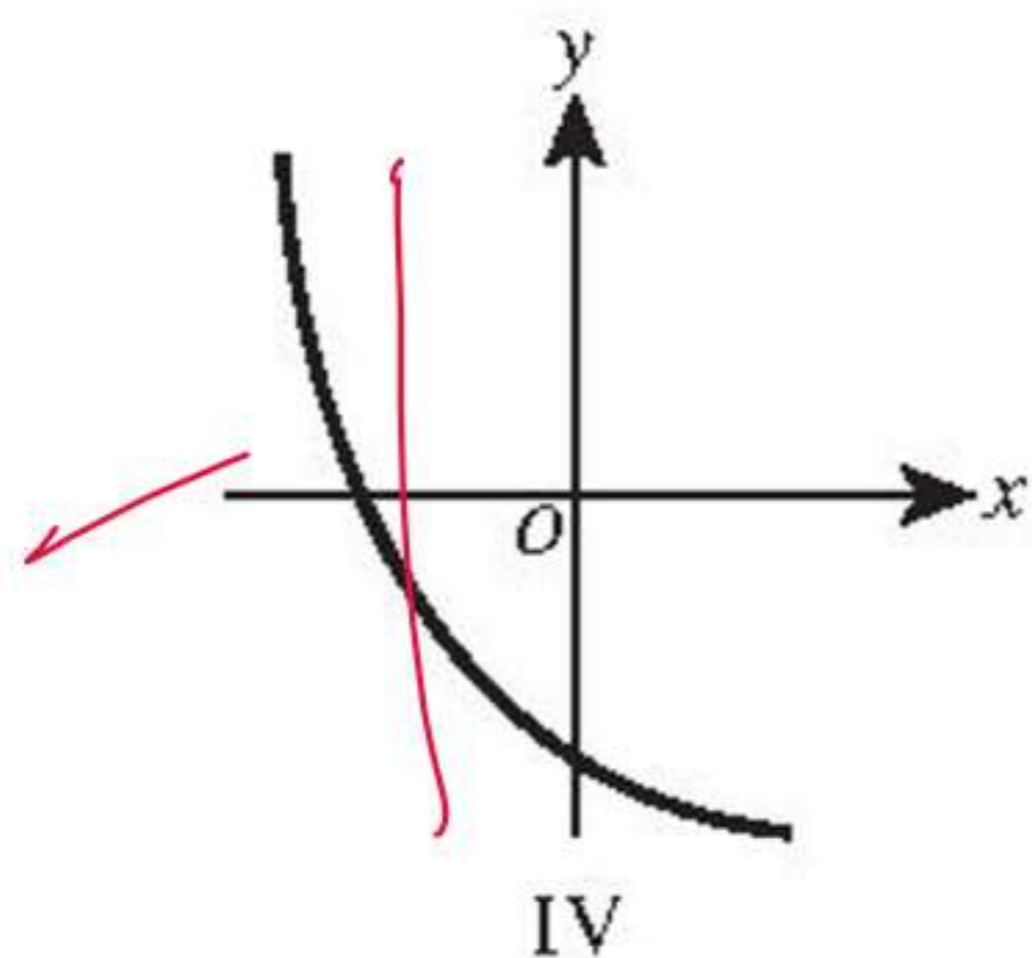
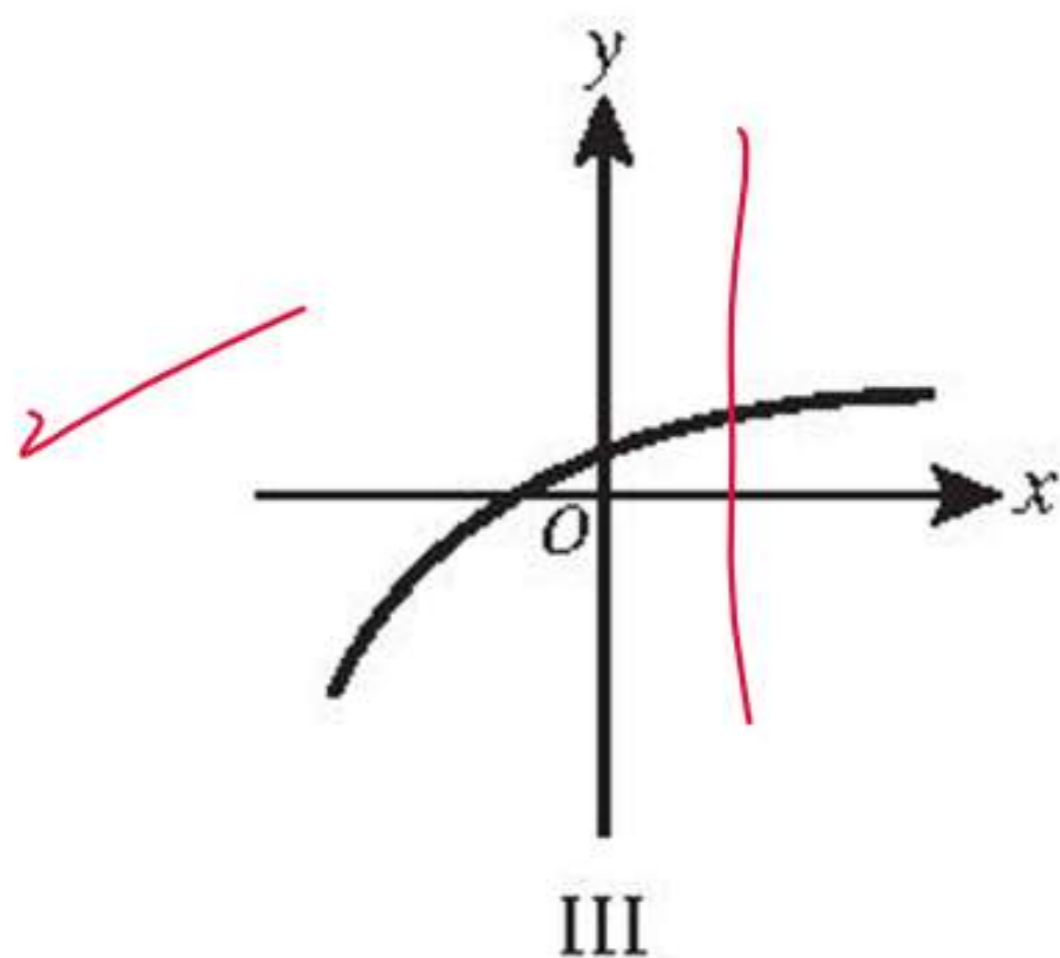
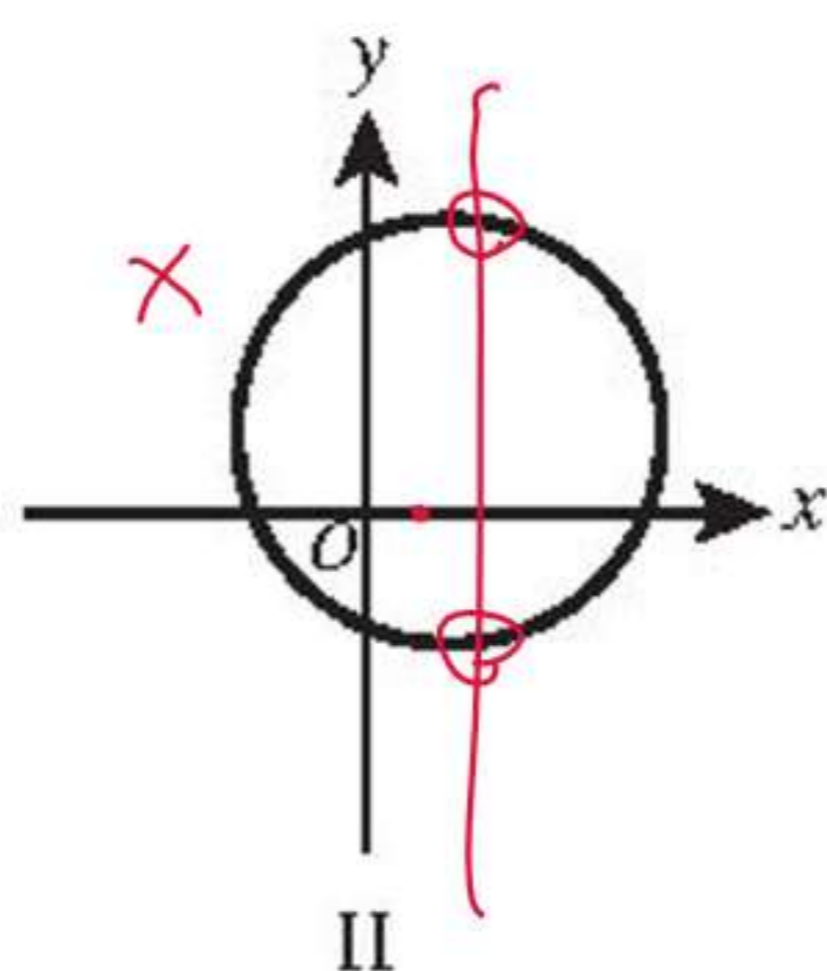
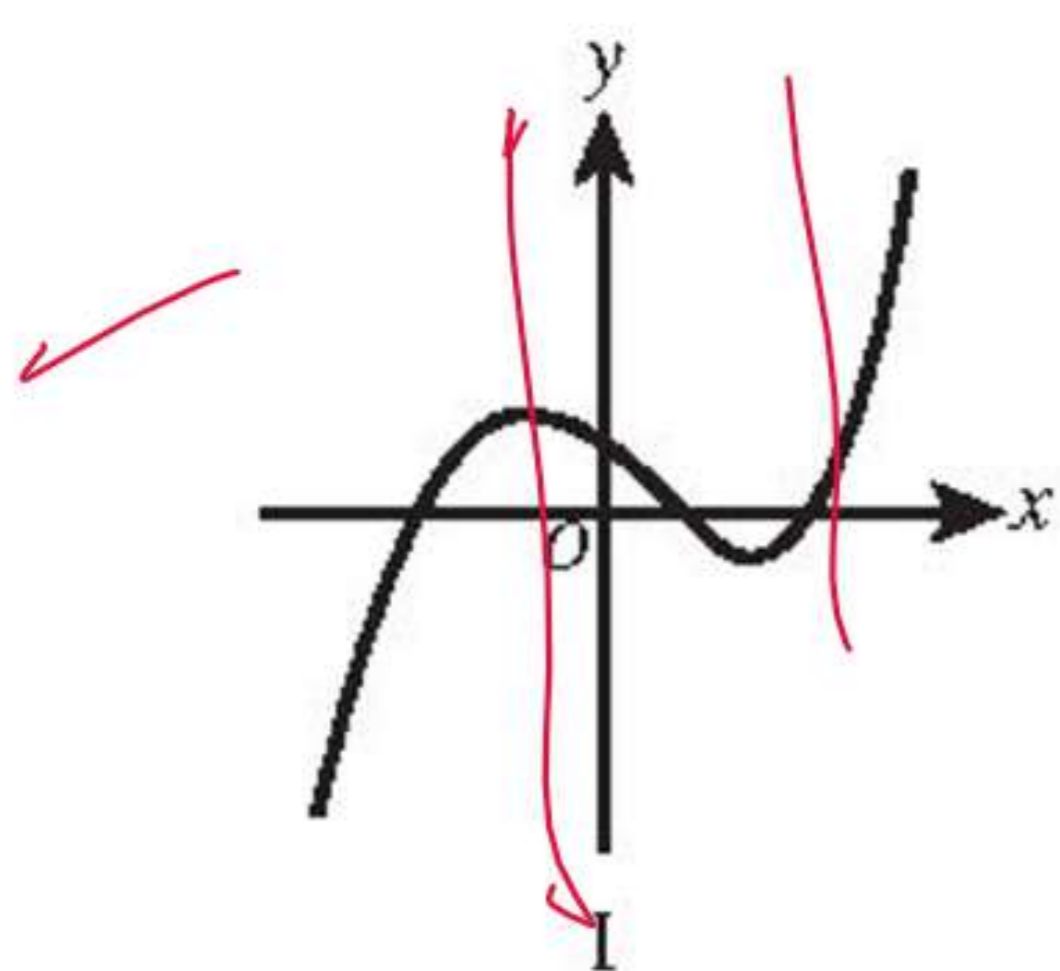
$$= \frac{1}{9}$$



13. The equations of four (x,y) relations are given below.

- I. $5y = (x-1)(x-3)(x+3)$
- II. $(x-1)^2 + (y-1)^2 = 9$
- III. $\frac{y}{4} = \sqrt{x+4} - 1$
- IV. $y + 5 = \left(\frac{2}{5}\right)^x$

The graph in the standard (x,y) coordinate plane of each of these relations is shown below.



Of these relations, which are functions?

- A. I only
- B. I and III only
- C. I and IV only
- D. I, II, and III only
- E. I, III, and IV only

14. If $(x+k)^2 = x^2 + 88x + k^2$, then $k = ?$

- E. 44
- G. 88
- H. 176
- J. 352
- K. 704

$$(2+k)^2 = (2)^2 + 88(2) + k^2$$

shift same

$$(a+b)^2 = a^2 + 2ab + b^2$$

$$(a-b)^2 = a^2 - 2ab + b^2$$

$$a^2 - b^2 = (a-b)(a+b)$$

$$(x+k)^2 = x^2 + 2Kx + k^2$$

$$2K = 88 \quad K = 44$$